CLAIMS

1. A system in package (SiP) device, comprising:

a first semiconductor device and an opposing second semiconductor device spaced apart from the first semiconductor device;

a dielectric layer interposed between the first semiconductor device and the second semiconductor device;

a first conductive pad positioned in the first semiconductor device; and

a second conductive pad positioned in the second semiconductor device and configured to capacitively communicate signals from the second semiconductor device to the first semiconductor device.

2. The system in package (SiP) device of claim 1, wherein the first conductive pad and the second conductive pad are positioned proximate to the dielectric layer.

3. The system in package (SiP) device of claim 2, wherein the first conductive pad and the second conductive pad substantially abut the dielectric layer.

4. The system in package (SiP) device of claim 1, wherein the first conductive pad and the second conductive pad are positioned in the respective first and second devices so that the first conductive pad and the second conductive pad are approximately mutually in alignment.

5. The system in package (SiP) device of claim 1, further comprising a transmitter coupled to the first conductive pad and a receiver coupled to second conductive pad.

6. The system in package (SiP) device of claim 5, wherein at least one of the transmitter and the receiver are positioned laterally adjacent to the respective first conductive pad and the second conductive pad.

7. The system in package (SiP) device of claim 5, wherein at least one of the transmitter and the receiver are positioned beneath the respective first conductive pad and the second conductive pad.

8. The system in package (SiP) device of claim 1, wherein the first conductive pad and the second conductive pad are comprised of a metal.

9. The system in package (SiP) device of claim 8, wherein the metal comprises copper.

10. The system in package (SiP) device of claim 8, wherein the metal comprises aluminum.

11. The system in package (SiP) device of claim 1, wherein the first conductive pad and the second conductive pad are comprised of polysilicon.

12. The system in package (SiP) device of claim 1, wherein the dielectric layer comprises silicon dioxide.

13. The system in package (SiP) device of claim 1, wherein the dielectric layer comprises silicon nitride.

14. The system in package (SiP) device of claim 1, further comprising a guard ring coupled to a ground potential and positioned adjacent to at least one of the first conductive pad and the second conductive pad.

15. The system in package (SiP) device of claim 14, wherein the guard ring substantially circumferentially encloses at least one of the first conductive pad and the second conductive pad.

16. The system in package (SiP) device of claim 14, further comprising a ground plane positioned adjacent to at least one of the first conductive pad and the second conductive pad, wherein the guard ring is coupled to the ground plane.

17. A system in package (SiP) device, comprising:

a first semiconductor device having a first conductive signal pad positioned adjacent to a first surface;

a second semiconductor device having a second conductive signal pad positioned adjacent to an opposing second surface, the first surface being spaced apart from the second surface by a dielectric layer, the first conductive signal pad and the second conductive pad being substantially adjacent to each other to capacitively communicate signals between the first semiconductor device and the second semiconductor device.

18. The system in package (SiP) device of claim 17, further comprising a transmitter coupled to the first conductive signal pad and a receiver coupled to second conductive signal pad.

19. The system in package (SiP) device of claim 18, wherein at least one of the transmitter and the receiver are positioned laterally adjacent to the respective first conductive signal pad and the second conductive signal pad.

20. The system in package (SiP) device of claim 18, wherein at least one of the transmitter and the receiver are positioned beneath the respective first conductive pad and the second conductive pad.

21. The system in package (SiP) device of claim 17, wherein the first conductive signal pad and the second conductive signal pad have a width of approximately about 30 μm.

22. The system in package (SiP) device of claim 17, wherein the first conductive signal pad and the second conductive signal pad have a thickness of approximately about 0.85 μm.

23. The system in package (SiP) device of claim 17, further comprising a guard ring coupled to a ground potential and positioned adjacent to at least one of the first conductive signal pad and the second conductive signal pad.

24. The system in package (SiP) device of claim 23, wherein the guard ring is laterally spaced apart from the first conductive signal pad and the second conductive signal pad by approximately about 2 μm.

25. The system in package (SiP) device of claim 24, wherein the guard ring has a lateral width of approximately about 2 μm.

26. The system in package (SiP) device of claim 23, wherein the guard ring is circumferentially disposed about the first conductive signal pad and the second conductive signal pad.

27. The system in package (SiP) device of claim 23, further comprising a ground plane coupled to the guard ring.

28. The system in package (SiP) device of claim 27, wherein the ground plane is spaced apart from the guard ring by approximately about 1.9 μm.

29. A method of forming a system in package (SiP) device, comprising:

forming a first conductive signal pad on a surface of a first semiconductor device;

forming a second conductive signal pad on a surface of a second semiconductor device; and

interposing a dielectric layer between the first semiconductor device and the second semiconductor device that separates the first conductive signal pad and the second conductive signal pad.

30. The method of claim 29, wherein interposing a dielectric layer further comprises passivating the surface of the first semiconductor device and the surface of the second semiconductor device.

31. The method of claim 30, wherein interposing a dielectric layer further comprises adhesively bonding the dielectric layer to the first semiconductor device and the second semiconductor device.

32. The method of claim 30, wherein interposing a dielectric layer further comprises combining the first semiconductor device and the second semiconductor device by a covalent bonding process.

33. The method of claim 29, further comprising forming a guard ring in at least one of the first semiconductor device and the second semiconductor device, the guard ring being laterally spaced apart from at least one of the first conductive signal pad and the second conductive signal pad.

34. The method of claim 33, further comprising positioning a ground plane adjacent to at least one of the first conductive signal pad and the second conductive signal pad; and coupling the ground plane to the guard ring.

35. The method of claim 29, further comprising coupling a transmitter to the first conductive signal pad and coupling a receiver to the second conductive signal pad.

36. The method of claim 35, further comprising forming the transmitter laterally adjacent to the first conductive signal pad and forming the receiver laterally adjacent to the second conductive signal pad.

37. The method of claim 35, further comprising forming the transmitter below the first conductive signal pad and forming the receiver below the second conductive signal pad.

38. The method of claim 29, further comprising:

masking respective surfaces of the first semiconductor device and the second semiconductor device;

forming recesses in the respective surfaces; and

depositing a conductive material into the recesses.

40. The method of claim 38, wherein masking respective surfaces further comprises applying a photoresist material to the respective surfaces, exposing the photoresist to radiation of a selected wavelength, and developing the photoresist.

41. A method of coupling a signal from a first semiconductor device to a second semiconductor device, comprising:

forming a layer of dielectric material having opposed first and second surfaces;

forming a first conductive signal pad on a surface of the first semiconductor device, the first conductive signal pad being in contact with the dielectric material adjacent the first surface of the layer of dielectric material;

forming a second conductive signal pad on a surface of the second semiconductor device, the second conductive signal pad being in contact with the dielectric material adjacent the second surface of the layer of dielectric material; the second conductive

signal pad being positioned in sufficient proximity to the first conductive signal pad to be capacitively coupled to the first conductive signal pad;

applying a first signal to the first conductive signal pad; and

coupling the first signal from the second conductive signal pad after the first signal has been capacitively coupled from the first signal pad to the second signal pad.

42. The method of claim 41, further comprising:

forming a transmitter in the first semiconductor substrate that is coupled to the first conductive signal pad; and

forming a receiver in the second semiconductor substrate that is coupled to the second conductive signal pad.

43. The method of claim 42, wherein forming a transmitter in the first semiconductor substrate comprises forming the transmitter at a position laterally adjacent to the first conductive signal pad; and forming a receiver in the second semiconductor substrate comprises forming the receiver at a position laterally adjacent to the second conductive signal pad.

44. The method of claim 42, wherein forming a transmitter in the first semiconductor substrate comprises forming the transmitter at a location below the first conductive signal pad; and forming a receiver in the second semiconductor substrate comprises forming the receiver at a location below the second conductive signal pad.

45. The method of claim 41, wherein forming a layer of dielectric material having opposed first and second surfaces comprises forming a layer of silicon dioxide.

46. The method of claim 41, wherein forming a layer of dielectric material having opposed first and second surfaces comprises forming a layer of silicon nitride.

47. The method of claim 41, further comprising forming a guard ring adjacent to at least one of the first conductive signal pad and the second conductive signal pad that is coupled to a ground potential.

48. The method of claim 47, wherein forming a guard ring adjacent to at least one of the first conductive signal pad and the second conductive signal pad further comprises forming a guard ring that substantially circumferentially surrounds at least one of the first conductive signal pad and the second conductive signal pad.

49. The method of claim 41, further comprising forming a ground plane adjacent to at least one of the first conductive signal pad and the second conductive signal pad that is coupled to a ground potential.

50. A method of coupling a signal from a first semiconductor device to a second semiconductor device, comprising:

placing a layer of dielectric material between respective surfaces of the first and second semiconductor devices; and

capacitively coupling a signal through the layer of dielectric material from the surface of the first semiconductor device to the surface of the second semiconductor device.

51. The method of claim 50, further comprising positioning a transmitter in the first semiconductor substrate; and forming a receiver in the second semiconductor substrate.

52. The method of claim 50, wherein placing a layer of dielectric material comprises forming a layer of silicon dioxide.

53. The method of claim 50, wherein placing a layer of dielectric material comprises forming a layer of silicon nitride.